IBM System x3750 M4 (E5-4600 v2)

IBM Redbooks Product Guide

The IBM® System x3750 M4 is a 4-socket server featuring a streamlined design, optimized for price and performance, with best-in-class flexibility and expandability. Models of the x3750 M4, machine type 8752, are powered with Intel Xeon E5-4600 v2 processors, up to 12 cores each, for an entry-level 4-socket solution. The x3750 M4 provides maximum storage density, with flexible PCI and 10 Gb Ethernet networking options in a 2U form factor.

Suggested uses: High performance computing (HPC), workloads with floating-point computations, and small to medium databases requiring fast I/O; applications that require 4-socket performance without needing the scalability that the IBM X6 systems provide.

Figure 1. The IBM System x3750 M4

Did you know?

With a dense 2U design, the IBM System x3750 M4 provides advanced features and capabilities. These include support for up to four sockets and 48 DIMMs, mix and match internal storage, up to 16 HDDs or 32 eXFlash solid-state drives (SSDs), six hot-swap, dual-rotor fans and two power supplies.

A Mezzanine LOM socket provides a choice of 1 Gigabit Ethernet (GbE) or 10 GbE networking options. Predictive Failure Analysis and light path diagnostics proactively monitor the system's sub-components and provide advanced warning on power supplies, fans, drives, processors and memory.

Key features

The IBM System x3750 M4 blends outstanding flexibility and expandability. The x3750 M4 2+2 socket design enables pay-as-you-grow processing with the new Intel Xeon E5-4600 v2 series processors and memory scalability to help lower cost and manage growth. The 5+3 PCIe socket design allows you to pay for PCIe capabilities as needed.

With the capability to support up to 48 DIMMs, four sockets, mix and match internal storage with up to 16 HDDs or 32 eXFlash SSD drives, 6 hot-swap dual rotor fans, two power supplies, and a dedicated slot for Gigabit or 10 GbE networking with options, the x3750 M4 provides unmatched features and capabilities in a dense 2U design.

Scalability and performance

The x3750 M4 offers numerous features to boost performance, improve scalability, and reduce costs:

- The Intel Xeon processor E5-4600 v2 family improves productivity by offering superior system performance. It provides increased productivity by offering processors up to 12 cores each and processors with core speeds up to 3.3 GHz, L3 cache up to 30 MB, and two QuickPath Interconnect (QPI) interconnect links operating at up to 8 GTps.
- The x3750 M4 2+2 processor socket design enables pay-as-you-grow processing with the Intel Xeon E5-4600 v2 series processors and memory scalability to help lower cost and manage growth.
- Up to four processors, 48 cores, and 96 threads maximize the concurrent execution of multithreaded applications.
- Intelligent and adaptive system performance with Intel Turbo Boost Technology 2.0 allows processor cores to run at maximum speeds during peak workloads by temporarily going beyond processor TDP.
- Intel Hyper-Threading Technology boosts performance for multithreaded applications by enabling simultaneous multithreading within each processor core, up to two threads per core.
- Intel Virtualization Technology integrates hardware-level virtualization hooks that allow operating system vendors to better use the hardware for virtualization workloads.
- 48 Load Reduced DIMMs (LRDIMMs) of 1866 MHz DDR3 ECC memory provide speed, high availability, and a memory capacity of up to 1.5 TB.
- The use of IBM eXFlash solid-state drives (SSDs) instead of, or along with, traditional spinning drives (HDDs), can improve I/O performance. An SSD can support up to 100 times more I/O operations per second (IOPS) than a typical HDD.
- Up to 16 HDDs or 32 eXFlash SSDs, together with an optical drive at the same time, provide a flexible and scalable all-in-one platform to meet your increasing demands.
- The server offers a SAS switch backplane option to allow up to 16x 2.5-inch drives to attach to a single controller.
- The 5+3 PCI Express socket design of the server allows you to pay for PCIe capabilities as needed.
- The server has a dedicated flexible mezzanine LOM slot offering a variety of 10 GbE or Gigabit Ethernet adapters that do not occupy one of the 8 standard PCIe slots .
- The server offers PCI Express 3.0 I/O expansion capabilities that improve the theoretical maximum bandwidth by almost 100% (8 GTps per link using 128b/130b encoding) compared to the previous generation of PCI Express 2.0 (5 GTps per link using 8b/10b encoding).
- With Intel Integrated I/O Technology, the PCI Express 3.0 controller is integrated into the Intel Xeon processor E5 family. This integration reduces I/O latency and increases overall system performance.

Availability and serviceability

The x3750 M4 provides many features to simplify serviceability and increase system uptime:

- The server offers Chipkill, memory mirroring, and memory rank sparing for redundancy in the event of a memory failure.
- The server provides restart recovery for any failed processor. If a failure of processor 1 occurs, the server connects the Southbridge to processor 2 for reboot.
- Tool-less cover removal provides easy access to upgrades and serviceable parts, such as the processor, memory, and adapter cards.
- The server offers hot-swap drives, supporting RAID redundancy for data protection and greater system uptime.
- The server has up to two redundant hot-swap power supplies and six hot-swap dual-rotor N+N redundant fans to provide availability for business-critical applications.
- The power source independent light path diagnostics panel and individual light path LEDs lead the technician to failed (or failing) components, which simplifies servicing, speeds up problem resolution, and helps improve system availability.
- The x3750 M4 provides error checking, Predictive Failure Analysis (PFA), or both on the following components. Alerts are generated in advance of a possible failure, therefore increasing uptime.
    - Memory ECC correction (Chipkill technology)
    - Microprocessor built-in self test (BIST) and internal error checking
    - PCIe Bus parity checking
    - SAS Bus Parity
    - HDD and SSD drive CRC checking
    - Diskette CRC checking
    - USB CRC checking
    - Over temperature detection
    - Over/under voltage detection
    - Power supply error checking
    - Fan failure detection
    - Serial interface parity, overrun, and frame checking
- Solid-state drives (SSDs) offer more reliability than traditional mechanical HDDs for greater uptime.
- The built-in Integrated Management Module Version II (IMM2) continuously monitors system parameters, triggers alerts, and performs recovery actions in case of failures to minimize downtime.
- Built-in diagnostics, using Dynamic Systems Analysis (DSA) Preboot, speed up troubleshooting tasks to reduce service time.
- Three-year customer-replaceable unit and onsite limited warranty, 9 x 5 next business day. Optional service upgrades are available.

Manageability and security

Powerful systems management features simplify local and remote management of the x3750 M4:

- The server includes an Integrated Management Module II (IMM2) to monitor server availability and perform remote management. Remote presence support is standard.
- The integrated industry-standard Unified Extensible Firmware Interface (UEFI) enables improved setup, configuration, and updates, and simplifies error handling.
- Integrated Trusted Platform Module (TPM) 1.2 support enables advanced cryptographic functionality, such as digital signatures and remote attestation.
- Industry-standard Advanced Encryption Standard (AES) NI support for faster, stronger encryption.

- IBM Systems Director is included for proactive systems management. It offers comprehensive systems management tools that increases uptime, reduces costs, and improves productivity through advanced server management capabilities.
- Intel Execute Disable Bit functionality can prevent certain classes of malicious buffer overflow attacks when combined with a supported operating system.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks, allowing an application to run in its own isolated space, protected from all other software running on a system.

Energy efficiency

The x3750 M4 offers the following energy-efficiency features to save energy, reduce operational costs, and increase energy availability:

- Energy-efficient planar components help lower operational costs.
- Highly efficient 750 W DC, 900 W AC, and 1400 W AC power supplies. 80 PLUS Platinum certification at high-voltage AC.
- The Intel Xeon processor E5-4600 v2 product family offers better performance over the previous generation E5-4600, although it fits into the same TDP limits.
- Intel Intelligent Power Capability powers individual processor elements on and off as needed to reduce power draw.
- Low-voltage Intel Xeon processors draw less energy to satisfy the demands of power and thermally constrained data centers and telecommunication environments.
- Low-voltage 1.35 V DDR3 memory RDIMMs consume 19% less energy compared to 1.5 V DDR3 RDIMMs.
- Solid-state drives (SSDs) consume as much as 80% less power than traditional spinning 2.5-inch HDDs.
- The server uses hexagonal ventilation holes, which are a part of IBM Calibrated Vectored Cooling™ technology. Hexagonal holes can be grouped more densely than round holes, providing more efficient airflow through the system.
- IBM Systems Director Active Energy Manager™ provides advanced data center power notification and management to help achieve lower heat output and reduced cooling needs.

Locations of key components and connectors

Figure 2 shows the front of the server.

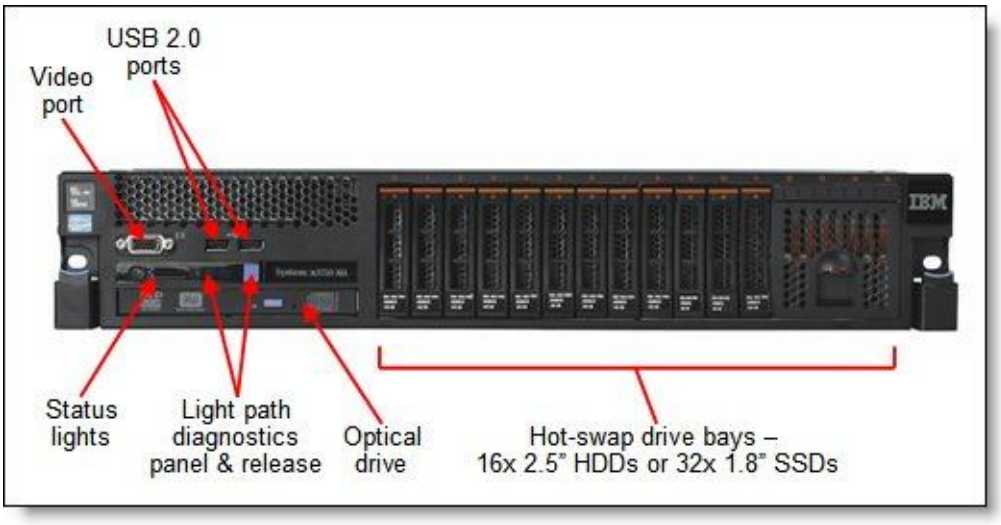
USB 2.0 ports
Video port
Status lights
Light path diagnostics panel & release
Optical drive
Hot-swap drive bays – 16x 2.5" HDDs or 32x 1.8" SSDs

Figure 2. Front view of the IBM System x3750 M4

Figure 3 shows the rear of the server.

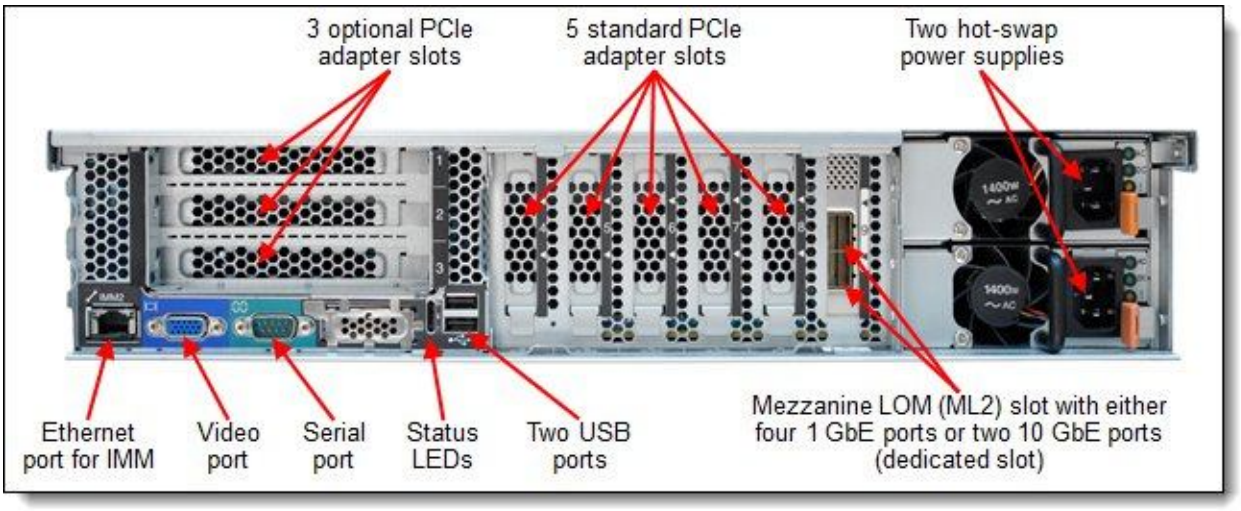
3 optional PCIe adapter slots
5 standard PCIe adapter slots
Two hot-swap power supplies
Ethernet port for IMM
Video port
Serial port
Status LEDs
Two USB ports
Mezzanine LOM (ML2) slot with either four 1 GbE ports or two 10 GbE ports (dedicated slot)

Figure 3. Rear view of the IBM System x3750 M4 (machine type 8752)

Figure 4 shows the locations of key components inside the server.

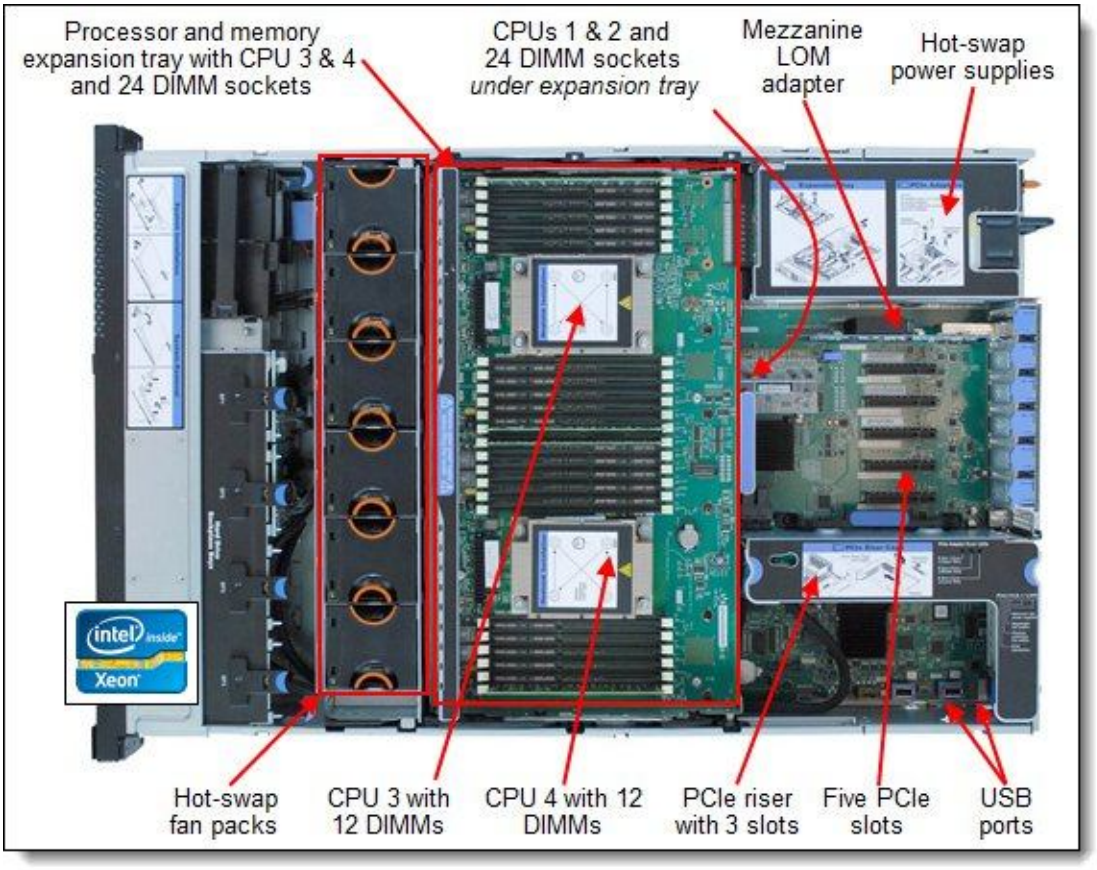
Processor and memory expansion tray with CPU 3 & 4 and 24 DIMM sockets
CPUs 1 & 2 and 24 DIMM sockets under expansion tray
Mezzanine LOM adapter
Hot-swap power supplies
Hot-swap fan packs
CPU 3 with 12 DIMMs
CPU 4 with 12 DIMMs
PCIe riser with 3 slots
Five PCIe slots
USB ports

Figure 4. Inside view of the IBM System x3750 M4 (machine type 8752)

Standard specifications

Table 1 lists the standard specifications.

Table 1. Standard specifications (part 1)

Components	Specification
Machine type	8752
Form factor	2U rack.
Processor	Up to four Intel Xeon E5-4600 v2 processors, each with 12 cores (2.4 GHz), ten cores (up to 2.4 GHz), eight cores (up to 3.3 GHz), six cores (2.6 GHz), or four cores (2.2 GHz). Up to 1866 MHz memory speed. Up to 30 MB L3 cache per processor. Two processor sockets on the system board and two processors on the processor and memory expansion tray (standard on most models). Two QPI links up to 8.0 GTps each.
Chipset	Intel C600 series.
Memory	Up to 48 DIMM sockets (12 DIMMs per processor). RDIMMs and LRDIMMs (Load Reduced DIMMs) are supported, but memory types cannot be intermixed. The memory speed is up to 1866 MHz. There are 24 DIMM sockets on the system board. There are an additional 24 DIMM sockets on the processor and memory expansion tray (standard on most models).
Memory maximums	With RDIMMs: Up to 768 GB with 48x 16 GB RDIMMs and four processors. With LRDIMMs: Up to 1.5 TB with 48x 32 GB LRDIMMs and four processors.
Memory protection	ECC, Chipkill (for x4-based memory DIMMs), memory mirroring, and memory sparing.
Disk drive bays	Up to 16 2.5-inch hot-swap SAS/SATA bays or up to 32 1.8-inch hot-swap solid-state drive (SSD) eXFlash bays. Drive bays can be in any combination of four 2.5-inch drives or eight 1.8-inch eXFlash SSD drives.
Maximum internal storage	Up to 25.6 TB with 1.6 TB 2.5” SSDs, up to 19.2 TB with 1.2 TB 2.5" SAS HDDs, up to 16 TB with 1 TB 2.5" NL SAS/SATA HDDs. Intermix of SAS/SATA supported.
RAID support	RAID 0, 1, 10 with integrated ServeRAID M5210e with LSI SAS3108 RAID on Chip (ROC) controller. Optional upgrades to RAID 5 and 50 are available (1GB cache no battery, or 1 or 2 GB flash-backed cache). Optional upgrades to RAID 6 and 60 when cache is also installed.
Optical drive bays	There is one bay for an optional Multiburner drive.
Tape drive bays	None internal. Use a supported external tape drive.
Network interfaces	Dedicated mezzanine LOM adapter slot for a choice of 2-port 10 GbE (RJ45 or SFP+) or 4-port 1 GbE controller. One port can optionally be shared with the IMM2 management processor. Standard models include Intel I350-T4 ML2 Quad Port GbE Adapter (I350 based) except model C2x which includes Broadcom NetXtreme II ML2 Dual Port 10GbaseT (BCM57712 based)
PCI Expansion slots	Up to eight slots, five on the system board, up to three on an optional riser card. Slots 1, 2, and 3 are physically x16 slots. Alternative 2-slot riser with one x16 and one x8 slot also available. The slots are as follows: ● Slot 1: PCIe 3.0 x8; full-height, half-length (optional with riser card, requires processor 2) ● Slot 2: PCIe 3.0 x8; full-height, half-length (optional with riser card, requires processor 2) ● Slot 3: PCIe 3.0 x8; full-height, half-length (optional with riser card, requires processor 2) ● Slot 4: PCIe 3.0 x8; low profile (requires processor 2) ● Slot 5: PCIe 3.0 x8; low profile (requires processor 2) ● Slot 6: PCIe 3.0 x8; low profile ● Slot 7: PCIe 3.0 x8; low profile ● Slot 8: PCIe 3.0 x8; low profile

Table 1. Standard specifications (part 2)

Components	Specification
Ports	Front: Two USB 2.0 and one DB-15 video on front. Rear: Two USB 2.0, one DB-15 video, one DB-9 serial, one RJ-45 systems management ports, mezzanine LOM adapter with either four 1 GbE network ports or two 10 GbE (RJ-45 or SFP+) network ports in dedicated slot. Internal: Two internal USB ports (for the embedded hypervisor).
Cooling	IBM Calibrated Vectored Cooling with up to six N+N redundant hot swap fans (all six standard); each fan has two rotors.
Power supply	Up to two hot-swap redundant AC power supplies (80 PLUS Platinum certification). Standard models use 900W supplies; available 1400W AC and 750W DC options. Second power supply requires processor expansion tray (88Y7365) or the power interposer card (88Y7367) installed.
Video	Matrox G200eR2 with 16 MB memory integrated into the IMM2. Maximum resolution is 1600x1200 at 75 Hz with 16 M colors.
Hot-swap parts	Drives, power supplies, and fans.
Systems management	UEFI, IBM Integrated Management Module II (IMM2), Predictive Failure Analysis, Light Path Diagnostics, Automatic Server Restart, IBM Systems Director and Active Energy Manager, and the IBM ServerGuide. IMM Advanced Upgrade software feature for remote presence are standard with the x3750 M4.
Security features	Power-on password, administrator's password, Trusted Platform Module (TPM).
Operating systems supported	Microsoft Windows Server 2008 R2, 2012, 2012 R2; RHEL 6 x64; SLES 11 x64; VMware vSphere 5.1, 5.5
Limited warranty	Three-year customer-replaceable unit and onsite limited warranty with 9x5 next business day (NBD).
Service and support	Optional service upgrades are available through IBM ServicePac® offerings: Four-hour or two-hour response time, eight-hour fix time, one-year or two-year warranty extension, remote technical support for IBM hardware and some IBM and third-party applications.
Dimensions	Height: 86 mm (3.4 in.), width: 445 mm (17.5 in.), depth: 746 mm (29.4 in.)
Weight	Minimum configuration: 25 kg (55 lb.), maximum: 30 kg (65 lb.)

The x3750 M4 servers are shipped with the following items:

- Statement of Limited Warranty
- Important Notices
- Rack Installation Instructions
- Documentation CD that contains the *Installation and User's Guide*
- IBM System x® Gen-III Slides Kit
- IBM System x Gen-III Cable Management Arm (CMA)
- 2.8 m (9.2 ft.) C13-C14 power cord (one for models with one power supply, and two for models with two power supplies)

Standard models

Table 2 lists the standard models.

Table 2. Standard models

Model	Intel Xeon processor* (four maximum)**	Memory** (RDIMMs)	RAID controller	Hot-swap disk bays	Disks	PCIe	GbE‡	Power supply
Models announced March 2014								
8752-A1x	2x E5-4627 v2 8C 3.3GHz 16MB 1866MHz 130W	2x 8 GB 1866 MHz	M5210e	4x 2.5" 16 max	Open	5 / 8	4x 1GbE	1x 900W
8752-A2x	1x E5-4603 v2 4C 2.2GHz 10MB 1333MHz 95W	1x 8 GB** (1333 MHz)§	M5210e	Open	Open	5 / 8	4x 1GbE	1x 900W
8752-A3x	2x E5-4607 v2 6C 2.6GHz 15MB 1333MHz 95W	2x 8 GB (1333 MHz)§	M5210e	4x 2.5" 16 max	Open	5 / 8	4x 1GbE	1x 900W
8752-B1x	2x E5-4610 v2 8C 2.3GHz 16MB 1600MHz 95W	2x 8 GB 1600 MHz	M5210e	4x 2.5" 16 max	Open	5 / 8	4x 1GbE	1x 900W
8752-B2x	2x E5-4620 v2 8C 2.6GHz 20MB 1600MHz 95W	2x 8 GB 1600 MHz	M5210e	8x 1.8" 32 max	Open	8 / 8	4x 1GbE	1x 900W
8752-C1x	2x E5-4640 v2 10C 2.2GHz 20MB 1866MHz 95W	2x 8 GB 1600 MHz	M5210e (1GB,F,R5)†	4x 2.5" 16 max	Open	8 / 8	4x 1GbE	1x 900W
8752-C2x	2x E5-4650 v2 10C 2.4GHz 25MB 1866MHz 95W	2x 8 GB 1600 MHz	M5210e (1GB,F,R5)†	4x 2.5" 16 max	Open	5 / 8	2x 10GbE‡	1x 900W

* Processor detail: Processor quantity and model, cores, core speed, L3 cache, memory speed, and power consumption.
** All models except for 8752-A2x include the processor and memory expansion tray containing sockets for processors 3 and 4 and 24 DIMMs. For model A2x, order part number 88Y7365.
‡ Model 8752-C2x includes the Broadcom NetXtreme II ML2 Dual Port 10GbaseT adapter, 00D2026. All other models include the Intel I350-T4 ML2 Quad Port GbE Adapter, 00D1998
§ For these models, the standard DIMM is rated at 1600 MHz, but operates at up to 1333 MHz to match the processor memory speed
† Models C1x and C2x include the ServeRAID M5200 Series 1GB Flash/RAID 5 Upgrade (part number 47C8660) which is a 1 GB flash-backed cache with support for RAID 5.

See the Standards specifications section for information about the standard features of the server.

Processor options

The x3750 M4 supports the processor options listed in Table 3. The server supports up to four processors. Two processors are installed in sockets on the system board. Processors 3 and 4 are installed on the processor and memory expansion tray. Most models (with the exception of A2x, as listed in Table 2) have the expansion tray installed as standard. For model A2x, order part number 88Y7365 for the processor and memory expansion tray.

The following processor quantities are supported:

- One processor, installed in socket 1
- Two processors, installed in sockets 1 and 2
- Four processors, installed in all four sockets

Table 3 also shows which server models have each processor standard. If there is no corresponding *where-used* model for a particular processor, this processor is only available through CTO.

Table 3. Processor options

Part number	Feature code*	Description	Models where used
88Y7365	A29Z	IBM System x3750 M4 processor and memory expansion tray	All except A2x
00D1948	A43K / A43U	Intel Xeon E5-4603 v2 4C 2.2GHz 10MB 1333MHz 95W	8752-A2x
00D1953	A43L / A43V	Intel Xeon E5-4607 v2 6C 2.6GHz 15MB 1333MHz 95W	8752-A3x
00D1958	A43M / A43W	Intel Xeon E5-4610 v2 8C 2.3GHz 16MB 1600MHz 95W	8752-B1x
00D1963	A43N / A43X	Intel Xeon E5-4620 v2 8C 2.6GHz 20MB 1600MHz 95W	8752-B2x
00D1978	A43R / A440	Intel Xeon E5-4627 v2 8C 3.3GHz 16MB 1866MHz 130W	8752-A1x
00D0574	A452 / A453	Intel Xeon E5-4624L v2 10C 1.9GHz 25MB 1866MHz 70W	-
00D1968	A43P / A43Y	Intel Xeon E5-4640 v2 10C 2.2GHz 20MB 1866MHz 95W	8752-C1x
00D1973	A43Q / A43Z	Intel Xeon E5-4650 v2 10C 2.4GHz 25MB 1866MHz 95W	8752-C2x
00D1988	A43T / A442	Intel Xeon E5-4657L v2 12C 2.4GHz 30MB 1866MHz 115W	-

* The first feature code corresponds to the first processor installed; the second feature is for all additional processors.

Memory options

IBM DDR3 memory is compatibility-tested and tuned for optimal System x performance and throughput. IBM memory specifications are integrated into the light path diagnostics for immediate system performance feedback and optimum system uptime. From a service and support standpoint, IBM memory automatically assumes the IBM system warranty, and IBM provides service and support worldwide.

The IBM System x3750 M4 supports DDR3 memory. The server supports up to 48 DIMMs when four processors are installed, with 12 DIMMs for each processor. There are 24 DIMM sockets (for processors 1 and 2) on the system board. The remaining DIMM sockets (for processors 3 and 4) are on the processor and memory expansion tray. Each processor has four memory channels, and there are three DIMMs per channel.

The x3750 M4 memory system has been carefully tuned so that the server supports higher memory frequencies than the Intel processor specification. You can, for example, use low-voltage DIMMs but still operate them at the rated speed.

Table 4 lists the memory options that are available for the x3750 M4 server.

Table 4. Memory options

Part number	Feature code	Description	Maximum supported	Models where used
RDIMMs - 1866 MHz				
00D5048	A3QL	16GB (1x16GB, 2Rx4, 1.5V) PC3-14900 CL13 ECC DDR3 1866MHz LP RDIMM	48 (12 per processor)	-
00D5032	A3QG	8GB (1x8GB, 1Rx4, 1.5V) PC3-14900 CL13 ECC DDR3 1866MHz LP RDIMM	48 (12 per processor)	8752-A1x
00D5020	A3QD	4GB (1x4GB, 1Rx4, 1.5V) PC3-14900 CL13 ECC DDR3 1866MHz LP RDIMM	48 (12 per processor)	-
RDIMMs - 1600 MHz				
46W0672	A3QM	16GB (1x16GB, 2Rx4, 1.35V) PC3L-12800 CL11 ECC DDR3 1600MHz LP RDIMM	48 (12 per processor)	-
00D5036	A3QH	8GB (1x8GB, 1Rx4, 1.35V) PC3L-12800 CL11 ECC DDR3 1600MHz LP RDIMM	48 (12 per processor)	All other 8752 models
00D5024	A3QE	4GB (1x4GB, 1Rx4, 1.35V) PC3L-12800 CL11 ECC DDR3 1600MHz LP RDIMM	48 (12 per processor)	-
LRDIMMs				
46W0761	A47K	32GB (1x32GB, 4Rx4, 1.5V) PC3-14900 CL13 ECC DDR3 1866MHz LP LRDIMM	48 (12 per processor)	-

The following rules apply when selecting the memory configuration:

- The server supports RDIMMs and LRDIMMs. UDIMMs are not supported.
- Mixing different types of memory (RDIMMs and LRDIMMs) is not supported.
- Mixing 1.5 V and 1.35 V DIMMs in the same server is supported; in such a case, all DIMMs operate at 1.5 V.
- The maximum number of ranks per one channel is eight (with the exception of Load Reduced DIMMs, where more than eight ranks are supported, because one quad-rank LRDIMM provides the same electrical load on a memory bus as a single-rank RDIMM).
- The maximum quantity of DIMMs that can be installed in the server depends on the number of processors installed. The table shows the maximum when all four processors are installed. When two processors are installed, the maximum quantity supported is a half of the quantity that is shown.
- All DIMMs in the server operate at the same speed, which is determined as the lowest value of:
  - Memory speed that is supported by the specific processor.
  - Lowest of maximum operating speeds for selected memory configuration that depends on rated speed, operating voltage, and quantity of DIMMs per channel, as shown under "Max. operating speed" section in the next table.

Table highlighting

- The entries highlighted in **red text** in Table 5 indicate that the IBM System x3750 M4 supports higher memory frequencies than the Intel processor specification. In some instances, this configuration also results larger memory capacity that the specification recommends.
- Tables cells highlighted with a gray background indicate when the specific combination of DIMM voltage and number of DIMMs per channel still allows the DIMMs to operate at rated speed

Table 5. Maximum memory speeds

DIMM specification	**RDIMM**						**LRDIMM**
Ranks	Single-rank DIMMs			Dual-rank DIMMs			Quad-rank LRDIMMs
Part numbers	00D5024 (4 GB) 00D5036 (8 GB)		00D5020 (4 GB) 00D5032 (8 GB)	46W0672(16 GB)		00D5048 (16 GB)	46W0761 (32 GB)
Rated speed	1600 MHz		1866 MHz	1600 MHz		1866 MHz	1866 MHz
Rated voltage	1.35 V		1.5 V	1.35 V		1.5 V	1.5 V
Operating voltage	1.35 V	1.5 V	1.5 V	1.35 V	1.5 V	1.5 V	1.5 V
Max. qty supported*	48	48	48	48	48	48	48
Max. DIMM capacity	8 GB	8 GB	8 GB	16 GB	16 GB	16 GB	32 GB
Max. mem. capacity	384 GB	384 GB	384 GB	768 GB	768 GB	768 GB	1.5 TB
Max memory at maximum speed	256 GB	256 GB	256 GB	512 GB	768 GB	512 GB	1.0 TB
Max operating speed (MHz)							
1 DIMM per channel	1333 MHz	1600 MHz	1866 MHz	1333 MHz	1600 MHz	1866 MHz	1866 MHz
2 DIMMs per channel	**1600 MHz**	1600 MHz	**1866 MHz**	**1600 MHz**	**1600 MHz**	**1866 MHz**	1866 MHz
3 DIMMs per channel	**1066 MHz**	**1333 MHz**	**1333 MHz**	**1066 MHz**	**1333 MHz**	**1333 MHz**	**1333 MHz**

* Maximum quantity supported is shown for four processors installed. When two processors are installed, the maximum quantity supported is a half of the quantity that is shown. When one processor is installed, the quantity is one quarter of that shown.

The following memory protection technologies are supported:

- ECC
- Chipkill (for x4-based memory DIMMs, look for "x4" in the DIMM description)
- Memory mirroring
- Memory rank sparing

If memory mirroring is used, then DIMMs must be installed in pairs (minimum of one pair per CPU), and both DIMMs in a pair must be identical in type and size.

If memory rank sparing is used, then a minimum of one quad-rank DIMM or two single-rank or dual-rank DIMMs must be installed per populated channel (the DIMMs do not need being identical). In rank sparing mode, one rank of a DIMM in each populated channel is reserved as spare memory. The size of a rank varies depending on the DIMMs installed.

Internal storage

The server can support up to 16x 2.5-inch drives, up to 32x 1.8-inch drives, or a combination of both 2.5-inch and 1.8-inch hot-swap drives, using the supported SAS/SATA backplane configurations. The server supports 2.5-inch hot-swap SAS or hot-swap SATA hard disk drives, 2.5-inch hot-swap SATA solid-state drives, or 1.8-inch hot-swap SATA solid-state drives. You can mix drives in the same server if you do not mix drives on the same array.

Backplanes

IBM System x3750 M4 server supports various internal storage configurations based on four different backplanes:

- 4-drive backplane for 2.5-inch drives: Up to four backplanes can be installed, each requiring one SAS connection to a supported controller. One RAID controller can connect to two of these backplanes.
- 8-drive backplane for 2.5-inch drives: Up to two backplanes can be installed, each requiring two SAS connections. One RAID controller per backplane.
- 8-drive backplane with a SAS expander for 2.5-inch drives: Use with the other 2.5-inch drive backplanes (8-drive or one 4-drive or two 4-drive backplanes) which will result in being able to connect up to 16 2.5-inch drive bays to the one RAID controller.
- 8-drive backplane for 1.8-inch solid-state drives (eXFlash Pack): Up to four backplanes can be installed, each requiring two SAS connections. One RAID controller per backplane. Cannot be connected to the 8-drive backplane with a SAS expander.

When building drive backplane configurations, all 1.8-inch SSD drive backplanes must be installed to the right of all 2.5-inch HDD or 2.5-inch SSD drive backplanes (when looking at the front of the server). Every four drives uses a SAS signal cable except when the 8-drive backplane with SAS expander is used. When the 8-drive backplane with SAS expander is used, the other backplanes connect to the SAS expander backplane with the supplied cables and then the SAS expander backplane is connected to the single RAID controller with two cables. All backplane options include the necessary cables.

See the *IBM System x3750 M4 Installation and Service Guide* for a description of all supported backplane combinations.

Standard models (all models except A2x) ship with at least one backplane; see Table 2 for details. Table 6 shows the backplane options that are available for a x3750 M4 server.

Table 6. Internal storage expansion options

Part number	Feature code	Name	Maximum supported
00D2020	A2A3	IBM 4x 2.5-in. HS SAS HDD Backplane	4*
00D2022	A2A4	IBM 8x 2.5-in. HS SAS HDD Backplane	2
00D2011	A2A2	IBM 8x 2.5-in. HS SAS HDD Backplane with RAID expansion (SAS expander)	1**
00D2024	9281	IBM eXFlash 8x 1.8-in. HS SAS SSD Backplane	4

* When a server is ordered via CTO, only one 4-drive backplane can be selected. If the order has more than 4 drive bays, 8-drive backplanes will be selected instead.
** Only one backplane with SAS expander (00D2011) can be installed in a server and can be used connected to a single 8-drive backplane (00D2022), a single 4-drive backplane (00D2020), or two 4-drive backplanes (00D2020). The SAS expander backplane cannot be used with the eXFlash backplane.

Controllers for internal storage

Table 7 lists the RAID controllers and SAS HBAs used for the internal disk storage of the x3750 M4 server.

Table 7. RAID controllers for internal storage

Part number	Feature code	Description	Maximum supported	Models where used
None	A3QA	SeveRAID M5210e SAS/SATA Controller	1 (integrated)	All
46C9110	A3YZ	ServeRAID M5210 SAS/SATA Controller	3	-
47C8675	A3YY	N2215 SAS/SATA HBA for IBM System x	3	-

The integrated ServeRAID M5210e SAS/SATA controller in a chip on the system board for machine type 8752. It has the following specifications:

- LSI SAS3108 RAID on Chip (ROC) controller.
- Eight internal SAS/SATA ports.
- Two internal x4 HD Mini-SAS connectors (SFF-8643).
- PCI Express 3.0 x8 host interface.
- Support for RAID 0, 1, and 10 standard
- Support for RAID 5, 50, 6, and 60 with optional upgrades.
- Optional onboard data cache: 1 GB (no battery backup), or 1 or 2 GB with flash backup
- Optional support for self-encrypting drives (SEDs) with MegaRAID SafeStore.

Note: The drives and backplanes currently supported in the x3750 M4 operate at 6 Gbps speeds, so the M5210e will also operate at 6 Gbps.

For more information, see the list of IBM Redbooks® Product Guides in the RAID adapters category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=raid

Note: The supported adapters for internal storage need to be installed in slots 1, 2 and 3 because of cable routing requirements. One of the supported riser cards must be installed. These slots also require that Processor 2 be installed.

Table 8 lists the optional upgrades supported with the ServeRAID controllers.

Table 8. RAID controller upgrades

Part number	Feature code	Description	Upgrade type	Maximum supported
47C8656	A3Z0	ServeRAID M5200 Series 1GB Cache/RAID 5 Upgrade	Hardware	4
47C8660	A3Z1	ServeRAID M5200 Series 1GB Flash/RAID 5 Upgrade	Hardware	4
47C8664	A3Z2	ServeRAID M5200 Series 2GB Flash/RAID 5 Upgrade	Hardware	4
47C8706	A3Z5	ServeRAID M5200 Series RAID 6 Upgrade-FoD	FoD	1*
47C8708	A3Z6	ServeRAID M5200 Series Zero Cache/RAID 5-FoD	FoD	1
47C8710	A3Z7	ServeRAID M5200 Series Performance Accelerator-FoD	FoD	1*
47C8712	A3Z8	ServeRAID M5200 Series SSD Caching Enabler-FoD	FoD	1*

* M5200 RAID upgrades require one of the cache upgrades (47C8656, 47C8660 or 47C8664)

Internal drive options

Table 9 lists the hard disk drive options for the internal disk storage of the x3750 M4 server.

Table 9. Disk drive options for internal disk storage (Part 1)

Part number	Feature code	Description	Maximum supported
2.5-inch 10K SAS Hot-Swap HDDs			
00AD075	A48S	IBM 1.2TB 10K 6Gbps SAS 2.5" G2HS HDD	16
81Y9650	A282	IBM 900GB 10K 6Gbps SAS 2.5" SFF HS HDD	16
90Y8872	A2XD	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	16
90Y8877	A2XC	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS HDD	16
2.5-inch 15K SAS Hot-Swap HDDs			
81Y9670	A283	IBM 300GB 15K 6Gbps SAS 2.5" G2HS HDD	16
90Y8926	A2XB	IBM 146GB 15K 6Gbps SAS 2.5" SFF G2HS HDD	16
90Y8944	A2ZK	IBM 146GB 15K 6Gbps SAS 2.5" SFF G2HS SED	16
2.5-inch NL SATA Hot-Swap HDDs			
81Y9730	A1AV	IBM 1TB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	16
81Y9722	A1NX	IBM 250GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	16
81Y9726	A1NZ	IBM 500GB 7.2K 6Gbps NL SATA 2.5" SFF HS HDD	16
2.5-inch NL SAS Hot-Swap HDDs			
81Y9690	A1P3	IBM 1TB 7.2K 6Gbps NL SAS 2.5" SFF HS HDD	16
90Y8953	A2XE	IBM 500GB 7.2K 6Gbps NL SAS 2.5" SFF G2HS HDD	16
2.5-inch SAS Hot-Swap SEDs			
00AD085	A48T	IBM 1.2TB 10K 6Gbps SAS 2.5" G2HS SED	16
81Y9662	A3EG	IBM 900GB 10K 6Gbps SAS 2.5" SFF G2HS SED	16
90Y8908	A3EF	IBM 600GB 10K 6Gbps SAS 2.5" SFF G2HS SED	16
90Y8913	A2XF	IBM 300GB 10K 6Gbps SAS 2.5" SFF G2HS SED	16
SAS-SSD hybrid drives			
00AD102	A4G7	IBM 600GB 10K 6Gbps SAS 2.5" G2HS Hybrid	16

Table 9. Disk drive options for internal disk storage (Part 2)

Part number	Feature code	Description	Maximum supported
2.5-inch SSDs - Enterprise			
49Y6195	A4GH	IBM 1.6TB SAS 2.5" MLC HS Enterprise SSD	16
49Y6139	A3F0	IBM 800GB SAS 2.5" MLC HS Enterprise SSD	16
49Y6134	A3EY	IBM 400GB SAS 2.5" MLC HS Enterprise SSD	16
49Y6129	A3EW	IBM 200GB SAS 2.5" MLC HS Enterprise SSD	16
41Y8331	A4FL	S3700 200GB SATA 2.5" MLC HS Enterprise SSD	16
41Y8336	A4FN	S3700 400GB SATA 2.5" MLC HS Enterprise SSD	16
41Y8341	A4FQ	S3700 800GB SATA 2.5" MLC HS Enterprise SSD	16
2.5-inch SSDs - Enterprise Value			
00AJ000	A4KM	S3500 120GB SATA 2.5" MLC HS Enterprise Value SSD	16
00AJ005	A4KN	S3500 240GB SATA 2.5" MLC HS Enterprise Value SSD	16
00AJ010	A4KP	S3500 480GB SATA 2.5" MLC HS Enterprise Value SSD	16
00AJ015	A4KQ	S3500 800GB SATA 2.5" MLC HS Enterprise Value SSD	16
1.8-inch SSDs - Enterprise			
41Y8366	A4FS	S3700 200GB SATA 1.8" MLC Enterprise SSD	32
41Y8371	A4FT	S3700 400GB SATA 1.8" MLC Enterprise SSD	32
1.8-inch SSDs - Enterprise Value			
00AJ040	A4KV	S3500 80GB SATA 1.8" MLC Enterprise Value SSD	32
00AJ045	A4KW	S3500 240GB SATA 1.8" MLC Enterprise Value SSD	32
00AJ050	A4KX	S3500 400GB SATA 1.8" MLC Enterprise Value SSD	32
00AJ455	A58U	S3500 800GB SATA 1.8" MLC Enterprise Value SSD	32

Internal backup units

The server does not supports any internal backup units, such as tape drives or RDX drives.

Optical drives

The server supports the optical drive options listed in Table 10.

Table 10. Optical drives

Part number	Feature code	Description	Maximum supported	Models where used
46M0902	4163	UltraSlim Enhanced SATA Multi-Burner	1	-

The IBM UltraSlim Enhanced SATA Multi-Burner (46M0902) supports the following media and speeds for reading:

- CD-ROM 24X
- CD-DA (DAE) 20X
- CD-R 24X
- CD-RW 24X
- DVD-ROM (single layer) 8X
- DVD-ROM (dual layer) 8X
- DVD-R (4.7 GB) 6X
- DVD-R DL 4X
- DVD+R 6X
- DVD+R DL 4X
- DVD-RW (4.7 GB) 4X
- DVD+RW 4X
- DVD-RAM (4.7/9.4 GB) 4X

The drive also supports the following media and speeds for writing:

- CD-R 24X
- CD-RW 4X
- High Speed CD-RW 10X
- Ultra Speed CD-RW 16X
- Ultra Speed Plus CD-RW 16X
- DVD-R 8X
- DVD-R DL 6X
- DVD+R 8X
- DVD+R DL 6X
- DVD-RW 6X
- DVD+RW 8X
- DVD-RAM 5X

I/O expansion options

The server supports up to eight PCIe slots, not including the mezzanine LOM slot. Five slots are on the system board and three are through a riser card. A riser card is standard on some models as shown in the table below. It is optional on all other models. The use of slots 1 - 5 require processor 2 to be installed. Table 11 lists the ordering information for the riser cards.

Table 11. PCI riser card options

Part number	Feature code	Description	Standard models where used	Maximum supported
88Y7371	A2A1	IBM x3750 M4 PCIe 3 x8 riser	B2x, C1x	1
00D2009	A419	IBM x3750 M4 PCIe 1x16 and 1x8 riser	-	1

The three slots on the PCIe 3 x8 riser are as follows:

- Slot 1: PCIe 3.0 x8 (x16 mechanical): Full-height, half-length (requires processor 2)
- Slot 2: PCIe 3.0 x8 (x16 mechanical): Full-height, half-length (requires processor 2)
- Slot 3: PCIe 3.0 x8 (x16 mechanical): Full-height, half-length (requires processor 2)

The two slots on the PCIe 1x16 and 1x8 riser are as follows:

- Slot 1: PCIe 3.0 x16: Full-height, half-length (requires processor 2)
- Slot 2: PCIe 3.0 x8 (x16 mechanical): Full-height, half-length (requires processor 2)
- Slot 3: Not present

The five standard slots on the system board are as follows:

- Slot 4: PCIe 3.0 x8: Low profile, half-length (requires processor 2)
- Slot 5: PCIe 3.0 x8: Low profile, half-length (requires processor 2)
- Slot 6: PCIe 3.0 x8: Low profile, half-length
- Slot 7: PCIe 3.0 x8: Low profile, half-length
- Slot 8: PCIe 3.0 x8: Low profile, half-length

Network adapters

The x3750 M4, machine type 8752 (using Intel Xeon E5-4600 v2 processors) offers a dedicated Mezzanine LOM slot for integrated networking. In addition to the usual networking functions for the installed operating system, this adapter also supports shared access to the IMM2 service processor if so enabled in UEFI. Table 12 lists the supported ML2 adapters that are installed in this slot. Only one adapter is supported.

Table 12. Mezzanine LOM network adapters

Part number	Feature code	Description	Maximum supported
10 Gb Ethernet			
00D2026	A40S	Broadcom NetXtreme II ML2 Dual Port 10GbaseT for IBM System x	1*
00D2028	A40T	Broadcom NetXtreme II ML2 Dual Port 10GbE SFP+ for IBM System x	1*
00D1996	A40Q	Emulex VFA5 ML2 Dual Port 10GbE SFP+ Adapter for IBM System x	1*
00D8544	A4NZ	Emulex VFA5 ML2 FCoE/iSCSI License for IBM System x (FoD) (FCoE/iSCSI upgrade for 00D1996)	1
00D1994	A40P	Intel X540 ML2 Dual Port 10GbaseT Adapter for IBM System x	1*
1 Gb Ethernet			
00D1998	A40R	Intel I350-T4 ML2 Quad Port GbE Adapter for IBM System x	1*

* These ML2 adapters occupy the same dedicated slot and are mutually exclusive.

Table 13 lists additional supported network adapters that can be installed in the eight regular PCIe slots.

Table 13. Network adapters

Part number	Feature code	Description	Maximum supported#
40 Gb Ethernet			
00D9550	A3PN	Mellanox ConnectX-3 40GbE / FDR IB VPI Adapter for IBM System x	8
10 Gb Ethernet			
94Y5180	A4Z6	Broadcom NetXtreme Dual Port 10GbE SFP+ Adapter for IBM System x	8
49Y7910	A18Y	Broadcom NetXtreme II Dual Port 10GBaseT Adapter for IBM System x	8
42C1820	1637	Brocade 10Gb CNA for IBM System x	8
00D8540	A4M9	Emulex Dual Port 10GbE SFP+ VFA IIIr for IBM System x	8
49Y7960	A2EC	Intel X520 Dual Port 10GbE SFP+ Adapter for IBM System x	8
49Y7970	A2ED	Intel X540-T2 Dual Port 10GBaseT Adapter for IBM System x	8
00D9690	A3PM	Mellanox ConnectX-3 10 GbE Adapter for IBM System x	8
42C1800	5751	QLogic 10Gb CNA for IBM System x	8
90Y4600	A3MR	QLogic 8200 Dual Port 10GbE SFP+ VFA for IBM System x	8
47C9952	A47H	Solarflare SFN5162F 2x10GbE SFP+ Performant Adapter for IBM System x	8
47C9960	A47J	Solarflare SFN6122F 2x10GbE SFP+ Onload Adapter for IBM System x	8
Gigabit Ethernet			
90Y9352	A2V3	Broadcom NetXtreme I Quad Port GbE Adapter for IBM System x	8
90Y9370	A2V4	Broadcom NetXtreme I Dual Port GbE Adapter for IBM System x	8
49Y4230	5767	Intel Ethernet Dual Port Server Adapter I340-T2 for IBM System x	8
49Y4240	5768	Intel Ethernet Quad Port Server Adapter I340-T4 for IBM System x	8
InfiniBand			
00D9550	A3PN	Mellanox ConnectX-3 40GbE / FDR IB VPI Adapter for IBM System x	8

Maximum quantity is achieved with processor 2 installed and the 3-slot riser card (88Y7371). With one processor, the maximum quantity is three (this maximum does not apply to the 10 Gb cards in the dedicated slot).

For more information, see the list of IBM Redbooks Product Guides in the Networking adapters category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=networkadapters

Storage host bus adapters

Table 14 lists storage HBAs supported by x3750 M4 server. The maximum quantity is achieved with processor 2 and the 3-slot riser card (88Y7371) installed. With one processor, the maximum quantity is three (this configuration does not apply to the 10 Gb cards in the dedicated slot).

Table 14. Storage adapters

Part number	Feature code	Description	Maximum supported#
Fibre Channel - 16 Gbps			
81Y1675	A2XV	Brocade 16Gb FC Dual-port HBA for IBM System x	8
81Y1668	A2XU	Brocade 16Gb FC Single-port HBA for IBM System x	8
81Y1662	A2W6	Emulex 16Gb FC Dual-port HBA for IBM System x	8
81Y1655	A2W5	Emulex 16Gb FC Single-port HBA for IBM System x	8
00Y3341	A3KX	QLogic 16Gb FC Dual-port HBA for IBM System x	8
00Y3337	A3KW	QLogic 16Gb FC Single-port HBA for IBM System x	8
Fibre Channel - 8 Gbps			
46M6050	3591	Brocade 8Gb FC Dual-port HBA for IBM System x	8
46M6049	3589	Brocade 8Gb FC Single-port HBA for IBM System x	8
42D0494	3581	Emulex 8Gb FC Dual-port HBA for IBM System x	8
42D0485	3580	Emulex 8Gb FC Single-port HBA for IBM System x	8
42D0510	3579	QLogic 8Gb FC Dual-port HBA for IBM System x	8
42D0501	3578	QLogic 8Gb FC Single-port HBA for IBM System x	8
SAS			
46C9010	A3MV	N2125 SAS/SATA HBA for IBM System x	8

Maximum quantity is achieved with processor 2 and the 3-slot riser card (88Y7371) installed. With one processor, the maximum quantity is three.

For more information, see the list of IBM Redbooks Product Guides in the Host bus adapters category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=hba

PCIe SSD adapters

The server supports the High IOPS SSD adapters listed Table 15.

Note: The server supports a maximum quantity of three of the full-height adapters, which must be installed in slots 1, 2, and 3. These slots require the second processor and the 3-slot riser card, 88Y7371.

Table 15. SSD adapters

Part number	Feature code	Description	Maximum supported
90Y4377	A3DY	IBM 1.2TB High IOPS MLC Mono Adapter	7
90Y4397	A3DZ	IBM 2.4TB High IOPS MLC Duo Adapter	3
46C9078	A3J3	IBM 365GB High IOPS MLC Mono Adapter	7
46C9081	A3J4	IBM 785GB High IOPS MLC Mono Adapter	7
90Y4361	A3MZ*	IBM 300GB High IOPS MLC Modular Adapter	3
90Y4365	A3N0*	IBM 600GB High IOPS MLC Modular Adapter	3
90Y4369	A3N1*	IBM 800GB High IOPS MLC Modular Adapter	3
90Y4373	A3N2*	IBM 300GB High IOPS SLC Modular Adapter	3

* These modular adapters are not available through CTO or Special build. The adapter cannot be shipped installed and instead must be shipped in its option box and configured at the final installation location. For more information, see http://ibm.com/support/entry/portal/docdisplay?lndocid=SERV-IOMA

For details about these adapters, see the IBM Redbooks Product Guide *IBM High IOPS SSD PCIe Adapters*, found at the following address:
http://www.redbooks.ibm.com/abstracts/tips0729.html?Open

Power supplies

The server supports up to two redundant power supplies. Standard models come with one or two 900 W power supplies (model dependent; see Table 2). 1400 W AC and 750 W DC power supplies also available through CTO or Special Bid.

Installing a second power supply requires that the processor and memory expansion tray (88Y7365) or the power interposer card (88Y7367) be installed. The power interposer card option enables redundancy power support when the processor and memory expansion tray is not installed. If you do not have the processor and memory expansion tray installed and want to install two power supplies, then the power interposer card must be installed.

Table 16. Power supplies

Part number	Feature code	Description	Maximum supported	Models where used
44X4150	A54D	IBM 1400W HE Redundant Power Supply for altitudes >5000 meters	2	-
44X4152	A54E	IBM 1400W HE Redundant Power Supply	2	-
88Y7431	A2A7	IBM 900 W Power Supply	2	All models
88Y7433	A2EA	IBM System x 4S- 750W High Efficiency -48 V DC Power Supply	2	-
88Y7367	A2A0	IBM Power Interposer for Redundant Power Supply	1*	-

* The power interposer is not needed if the processor and memory expansion tray (88Y7365) is installed.

Each AC power supply ships standard with one 2.8 m C13 - C14 power cord.

Two installed power supplies form a redundant pair. Under extreme configurations, with two 1400 W supplies installed, it might still be possible to exceed 1400 W DC output. If this condition exists and a power supply fails, the server caps power at 1400 W until the second power supply is back online.

Integrated virtualization

The server supports VMware ESXi installed on a USB memory key. The key is installed in a USB socket inside the server. Table 17 lists the virtualization options.

Table 17. Virtualization options

Part number	Feature code	Description	Maximum supported
41Y8298	A2G0	IBM Blank USB Memory Key for VMware ESXi Downloads	1

Download a supported VMware vSphere hypervisor image from http://ibm.com/systems/x/os/vmware/ and load it on the memory key using the instructions provided.

Remote management

The server contains IBM Integrated Management Module II (IMM2), which provides advanced service-processor control, monitoring, and alerting functions. If an environmental condition exceeds a threshold or if a system component fails, the IMM2 lights LEDs to help you diagnose the problem, records the error in the event log, and alerts you to the problem. A virtual presence capability also comes standard in this server for remote server management.

Remote server management is provided through industry-standard interfaces:

- Intelligent Platform Management Interface (IPMI) Version 2.0
- Simple Network Management Protocol (SNMP) Version 3
- Common Information Model (CIM)
- Web browser

The server also supports virtual media and remote control features, which provide the following functions:

- Remotely viewing video with graphics resolutions up to 1600x1200 at 75 Hz with up to 23 bits per pixel, regardless of the system state
- Remotely accessing the server using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM2 memory and mapping it to the server as a virtual drive
- Capturing blue-screen errors

Supported operating systems

The server supports the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2 with SP1
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE Linux Enterprise Server 11 for AMD64/EM64T SP3
- SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T SP3
- VMware vSphere 5.5 (ESXi)
- VMware vSphere 5.1 (ESXi) Update 1

For the latest information about the specific versions and service levels supported and any other prerequisites, see the IBM ServerProven® website, found at the following address:
http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/nos/matrix.shtml

Physical and electrical specifications

Dimensions and weight:

Width: 446 mm (17.5 in.)
Depth: 734 mm (28.9 in.)
Height: 87 mm (3.4 in.)
Approximate weight, fully configured: 31.1 kg (68.5 lb.)

Supported environment:

- Air temperature:
  - 5 - 40 °C (41 - 104 °F) at 0 - 3048 m (10,000 ft); ASHRAE A3 compliant
- Humidity: 8% - 80%
- Electrical:
  - 100 - 127 (nominal) V AC, 50 Hz or 60 Hz, and System 20 A (10 A per power supply)
  - 200 - 208 (nominal) V AC, 50 Hz or 60 Hz, and System 10 A
  - 200 - 240 (nominal) V AC, 50 Hz or 60 Hz, and System 9 A
  - Minimum configuration: 0.20 kVA (one power supply)
  - Minimum configuration: 0.26 kVA (two power supplies)
  - Typical configuration: 1.12 kVA (two power supplies)
  - Maximum configuration: 2.16 kVA (two power supplies)
- BTU output:
  - Minimum configuration: 648 BTU/hr (190 watts)
  - Maximum configuration: 7,336 BTU/hr (2150 watts)
- Noise level:
  - Idle: 6.5 bels
  - Operating: 6.6 bels

Warranty options

The IBM System x3750 M4 has a three-year onsite warranty with 9x5/next business day terms. IBM offers the warranty service upgrades through IBM ServicePac offerings, described in this section. The IBM ServicePac is a series of prepackaged warranty maintenance upgrades and post-warranty maintenance agreements with a well-defined scope of services, including service hours, response time, term of service, and service agreement terms and conditions.

IBM ServicePac offerings are country-specific, that is, each country might have its own service types, service levels, response times, and terms and conditions. Not all covered types of ServicePac offerings might be available in a particular country. For more information about the IBM ServicePac offerings that are available in your country, see the IBM ServicePac Product Selector:
https://www-304.ibm.com/sales/gss/download/spst/servicepac

Table 18 explains the warranty service definitions in more detail.

Table 18. Warranty service definitions

Term	Description
IBM onsite repair (IOR)	A service technician comes to the server's location for equipment repair.
24x7x2 hour	A service technician is scheduled to arrive at your customer's location within two hours after remote problem determination is completed. We provide service around the clock, every day, including IBM holidays.
24x7x4 hour	A service technician is scheduled to arrive at your customer's location within four hours after remote problem determination is completed. We provide service around the clock, every day, including IBM holidays.
9x5x4 hour	A service technician is scheduled to arrive at your customer's location within four business hours after remote problem determination is completed. We provide service from 8:00 a.m. to 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays. If the time is after 1:00 p.m., and it is determined that onsite service is required, the customer can expect the service technician to arrive the morning of the following business day. For noncritical service requests, a service technician arrives by the end of the following business day.
9x5 next business day	A service technician is scheduled to arrive at your customer's location on the business day after we receive your call, following remote problem determination. We provide service from 8:00 a.m. to 5:00 p.m. in the customer's local time zone, Monday through Friday, excluding IBM holidays.

In general, the types of IBM ServicePac offerings are as follows:

- Warranty and maintenance service upgrades:
  - One, 2, 3, 4, or 5 years of 9x5 or 24x7 service coverage
  - Onsite repair from next business day to 4 or 2 hours
  - One or two years of warranty extension
- Remote technical support services:
  - One or three years with 24x7 coverage (severity 1) or 9x5/next business day for all other severities
  - Installation and start-up support for System x servers
  - Remote technical support for System x servers
  - Software support - Support Line:
    - Microsoft or Linux software
    - VMware
    - IBM Systems Director

Regulatory compliance

The server conforms to the following standards:

- ASHRAE A3
- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 4, Class A
- UL/IEC 60950-1
- CSA C22.2 No. 60950-1
- NOM-019
- Argentina IEC60950-1
- Japan VCCI, Class A
- Australia/New Zealand AS/NZS CISPR 22, Class A
- IEC 60950-1(CB Certificate and CB Test Report)
- China CCC (GB4943), GB9254 Class A, GB17625.1
- Taiwan BSMI CNS13438, Class A; CNS14336-1
- Korea KN22, Class A; KN24
- Russia/GOST ME01, IEC-60950-1, GOST R 51318.22, GOST R 51318.24, GOST R 51317.3.2, and GOST R 51317.3.3
- IEC 60950-1 (CB Certificate and CB Test Report)
- CE Mark (EN55022 Class A, EN60950-1, EN55024, EN61000-3-2, and EN61000-3-3)
- CISPR 22, Class A
- TUV-GS (EN60950-1 /IEC60950-1,EK1-ITB2000)
- RoHS compliance (Directive 2002/95/EC)

External disk storage expansion

The external disk storage expansion enclosures listed Table 19 are available.

Table 19. External storage expansion enclosures

Part number	Description	Maximum quantity supported per one adapter
172701X	IBM System Storage® EXP3000	18 (9 per port)
174712X	IBM System Storage EXP2512 Express	18 (9 per port)
174724X	IBM System Storage EXP2524 Express	9 (9 per port)

The hard disk drives listed in Table 20 are supported with external expansion enclosures.

Table 20. Hard drive options for external expansion enclosures (Part 1)

Part number	Description	Maximum quantity supported per one enclosure
EXP3000 Hot-Swap SATA 3.5-in. Hard Drives		
43W7630	1000 GB Dual Port Hot Swap SATA	12
49Y1940	IBM 2 TB 7200 Dual Port SATA 3.5-in. HS HDD	12
EXP3000 Hot-Swap SAS 3.5-in. Hard Drives		
44W2234	IBM 300 GB 15 K 6 Gbps SAS 3.5-in. Hot-Swap HDD	12
44W2239	IBM 450 GB 15 K 6 Gbps SAS 3.5-in. Hot-Swap HDD	12
44W2244	IBM 600 GB 15 K 6 Gbps SAS 3.5-in. Hot-Swap HDD	12
EXP2512 Hot-Swap SAS 3.5-in. Hard Drives		
49Y1899	300 GB 15 K 6 Gb SAS 3.5-in. HDD	12
49Y1900	450 GB 15 K 6 Gb SAS 3.5-in. HDD	12
49Y1901	600 GB 15 K 6 Gb SAS 3.5-in. HDD	12
49Y1903	1 TB 7,200 RPM 6 Gb SAS NL 3.5-in. HDD	12
43W7630	1000 GB Dual Port Hot Swap SATA	12
49Y1902	2 TB 7,200 RPM 6 Gb SAS NL 3.5-in. HDD	12
90Y8720	3 TB 7,200 RPM 6 Gb SAS NL 3.5-in. HDD	12

Table 20. Hard drive options for external expansion enclosures (Part 2)

Part number	Description	Maximum quantity supported per one enclosure
EXP2524 Hot-Swap SAS 2.5-in. Hard Drives		
49Y1896	146 GB 15 K 6 Gb SAS 2.5-in. HDD	24
49Y1895	300 GB 10 K 6 Gb SAS 2.5-in. HDD	24
81Y9596	600 GB 10 K 6 Gb SAS 2.5-in. HDD	24
49Y1898	500 GB 7,200 RPM 6 Gb SAS NL 2.5-in. HDD	24
EXP2524 Hot-Swap SAS 2.5-in. Solid-State Drives		
81Y9956	200 GB 2.5-in. SAS SSD	24
81Y9960	400 GB 2.5-in. SAS SSD	24

The RAID controllers listed in Table 21 are supported with external expansion enclosures.

Table 21. RAID controller and options for external storage expansion enclosures

Part number	Feature code	Description	Maximum supported
81Y4478	A1WX	ServeRAID M5120 SAS/SATA Controller	4*
81Y4487	A1J4	ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade	1 per one M5120
81Y4559	A1WY	ServeRAID M5100 Series 1GB Flash/RAID 5 Upgrade	1 per one M5120
81Y4546	A1X3	ServeRAID M5100 Series RAID 6 Upgrade	1 per server
90Y4273	A2MC	ServeRAID M5100 Series SSD Performance Accelerator	1 per server
90Y4318	A2MD	ServeRAID M5100 Series SSD Caching Enabler	1 per server

* Each M5120 controller must have either the 512MB Flash/RAID 5 or the 1GB Flash/RAID 5 upgrade installed.

The ServeRAID M5120 SAS/SATA Controller has the following specifications:

- Eight external 6 Gbps SAS/SATA ports
- Two external x4 mini-SAS connectors (SFF-8088)
- Supports RAID levels 0, 1, and 10
- Supports RAID levels 5 and 50 with the required M5100 Series RAID 5 upgrades
- Supports RAID 6 and 60 with the optional M5100 Series RAID 6 Upgrade
- Supports 512 MB battery-backed cache or 512 MB or 1 GB flash-backed cache
- 6 Gbps throughput per port
- PCIe 3.0 x8 host interface
- Based on the LSI SAS2208 6 Gbps ROC controller
- Supports connectivity to the EXP2512 and EXP2524 storage expansion enclosures

For more information, see the IBM Redbooks® Product Guide *ServeRAID M5120 SAS/SATA Controller for IBM System x*, TIPS0858:
http://www.redbooks.ibm.com/abstracts/tips0858.html?Open

The external SAS cables listed in the following table are supported with external expansion enclosures and RAID controllers.

Table 22. External SAS cables for external storage expansion enclosures

Part number	Feature code	Description	Maximum quantity supported per enclosure*
39R6531	3707	IBM 3m SAS Cable	1
39R6529	3708	IBM 1m SAS Cable	1

*The EXP3000 and EX2500 series can be chained with each other. In such a case, one cable is used to connect first EXP25xx or EXP3000 to the RAID controller, and every consecutive EXP unit is connected to the previous one by one cable.

External disk storage systems

Table 23 lists the external storage systems that are supported by x3750 M4 and can be ordered through the System x sales channel. The server might support other IBM disk systems that are not listed in this table. See the IBM System Storage Interoperation Center for further information: http://www.ibm.com/systems/support/storage/ssic

Table 23. External disk storage systems

Part number	Description
1746A2D	IBM System Storage DS3512 Express Dual Controller Storage System
1746A2S	IBM System Storage DS3512 Express Single Controller Storage System
1746A4D	IBM System Storage DS3524 Express Dual Controller Storage System
1746A4S	IBM System Storage DS3524 Express Single Controller Storage System
181420A	IBM System Storage DS5020 Midrange Disk System

For more information, see the list of IBM Redbooks Product Guides in the System Storage category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=externalstorage

External backup units

The server supports the external backup attachment options that are listed in Table 24.

Table 24. External backup options (Part 1)

Part number	Description
External tape expansion enclosures for internal tape drives	
87651UX	1U Tape Drive Enclosure
8767HHX	Half High Tape Drive Enclosure
87651NX	1U Tape Drive Enclosure (with Nema 5-15P power cord)
8767HNX	Half High Tape Drive Enclosure (with Nema 5-15P power cord)
Tape enclosure adapters (with cables)	
44E8869	USB Enclosure Adapter Kit
40K2599	SAS Enclosure Adapter Kit
Internal backup drives supported by external tape enclosures	
43W8478	IBM Half High LTO Gen 3 SAS Tape Drive
44E8895	IBM Half High LTO Gen 4 SAS Tape Drive

Table 24. External backup options (Part 2)

Part number	Description
External backup units*	
36251TY	IBM RDX USB 3.0 Dock with 1TB Cartridge
362532Y	IBM RDX USB 3.0 Dock with 320GB Cartridge
362550Y	IBM RDX USB 3.0 Dock with 500GB Cartridge
3628L3X	IBM Half High LTO Gen 3 External SAS Tape Drive (with US power cord)
3628L4X	IBM Half High LTO Gen 4 External SAS Tape Drive (with US power cord)
3628L5X	IBM Half High LTO Gen 5 External SAS Tape Drive (with US power cord)
3628N3X	IBM Half High LTO Gen 3 External SAS Tape Drive (without power cord)
3628N4X	IBM Half High LTO Gen 4 External SAS Tape Drive (without power cord)
3628N5X	IBM Half High LTO Gen 5 External SAS Tape Drive (without power cord)
00D8924	IBM Half High LTO Ultrium Gen 6 Internal SAS Tape Drive

*The external tape drives listed can be ordered through System x sales channel. The server might support other IBM tape drives that are not listed in this table. See the IBM System Storage Interoperation Center for further information.

For the latest information about the specific versions and service levels supported and any other prerequisites, see the IBM ServerProven® website:
http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/nos/matrix.shtml

For more information, see the list of IBM Redbooks Product Guides in the Backup units category:
http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=tape

Top-of-rack Ethernet switches

The server supports the top-of-rack Ethernet switches from IBM System Networking listed in Table 25.

Table 25. IBM System Networking - Top-of-rack switches

Part number	Description
IBM System Networking - 1 Gb top-of-rack switches	
0446013	IBM System Networking RackSwitch G8000R
7309CFC	IBM System Networking RackSwitch G8000F
7309CD8	IBM System Networking RackSwitch G8000DC
7309G52	IBM System Networking RackSwitch G8052R
730952F	IBM System Networking RackSwitch G8052F
427348E	IBM Ethernet Switch J48E
6630010	Juniper Networks EX2200 24 Port
6630011	Juniper Networks EX2200 24 Port with PoE
6630012	Juniper Networks EX2200 48 Port
6630013	Juniper Networks EX2200 48 Port with PoE
IBM System Networking - 10 Gb top-of-rack switches	
7309DRX	IBM System Networking RackSwitch G8264CS (Rear to Front)
7309DFX	IBM System Networking RackSwitch G8264CS (Front to Rear)
7309BD5	IBM System Networking RackSwitch G8124DC
7309BR6	IBM System Networking RackSwitch G8124ER
7309BF7	IBM System Networking RackSwitch G8124EF
7309G64	IBM System Networking RackSwitch G8264R
730964F	IBM System Networking RackSwitch G8264F
7309CR9	IBM System Networking RackSwitch G8264TR
7309CF9	IBM System Networking RackSwitch G8264TF
0719410	Juniper Networks EX4500 - Front to Back Airflow
0719420	Juniper Networks EX4500 - Back to Front Airflow
IBM System Networking - 40 Gb top-of-rack switches	
8036BRX	IBM System Networking RackSwitch G8332 (Rear to Front)
8036BFX	IBM System Networking RackSwitch G8332 (Front to Rear)
8036ARX	IBM System Networking RackSwitch G8316R
8036AFX	IBM System Networking RackSwitch G8316F

For more information, see the list of IBM Redbooks Product Guides in the Top-of-rack switches category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=tor

Uninterruptible power supply units

The server supports attachments to the uninterruptible power supply (UPS) units listed in Table 26.

Table 26. Uninterruptible power supply units

Part number	Description
Rack-mounted UPS	
21304RX	IBM UPS 10000XHV
53952AX	IBM 2200VA LCD 2U Rack UPS (100 V/120 V)
53952KX	IBM 2200VA LCD 2U Rack UPS (230 V)
53953AX	IBM 3000VA LCD 3U Rack UPS (100 V/120 V)
53953JX	IBM 3000VA LCD 3U Rack UPS (200 V/208 V)
53956AX	IBM 6000VA LCD 4U Rack UPS (200 V/208 V)
53959KX	IBM 11000VA LCD 5U Rack UPS (200 V/208 V/230 V)

For more information, see the list of IBM Redbooks Product Guides in the Power infrastructure category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=power

Power distribution units

The server supports attachments to the power distribution units (PDUs) listed in Table 27.

Table 27. Power distribution units (part 1)

Part number	Description
Switched and Monitored PDUs	
46M4002	IBM 1U 9 C19/3 C13 Active Energy Manager DPI PDU
46M4003	IBM 1U 9 C19/3 C13 Active Energy Manager 60A 3 Phase PDU
46M4004	IBM 1U 12 C13 Active Energy Manager DPI PDU
46M4005	IBM 1U 12 C13 Active Energy Manager 60A 3 Phase PDU
46M4167	IBM 1U 9 C19/3 C13 Switched and Monitored 30A 3 Phase PDU
46M4116	IBM 0U 24 C13 Switched and Monitored 30A PDU
46M4134	IBM 0U 12 C19/12 C13 Switched and Monitored 50A 3 Phase PDU
Enterprise PDUs	
71762NX	IBM Ultra Density Enterprise PDU C19 PDU (WW)
71763MU	IBM Ultra Density Enterprise PDU C19 3 Phase 60A PDU+ (NA)
71763NU	IBM Ultra Density Enterprise PDU C19 3 Phase 60A PDU (NA)
39M2816	IBM DPI C13 Enterprise PDU without power cord
39Y8923	DPI 60A Three Phase C19 Enterprise PDU with IEC309 3P+G (208 V) fixed power cord
39Y8941	DPI Single Phase C13 Enterprise PDU without power cord
39Y8948	DPI Single Phase C19 Enterprise PDU without power cord
Front-end PDUs	
39Y8938	30 A/125 V Front-end PDU with NEMA L5-30P connector
39Y8939	30 A/250 V Front-end PDU with NEMA L6-30P connector
39Y8940	60 A/250 V Front-end PDU with IEC 309 60A 2P+N+Gnd connector

Table 27. Power distribution units (part 2)

Part number	Description
Universal PDUs	
39Y8951	DPI Universal Rack PDU with US LV and HV line cords
39Y8952	DPI Universal Rack PDU with CEE7-VII Europe LC
39Y8953	DPI Universal Rack PDU with Denmark LC
39Y8954	DPI Universal Rack PDU with Israel LC
39Y8955	DPI Universal Rack PDU with Italy LC
39Y8956	DPI Universal Rack PDU with South Africa LC
39Y8957	DPI Universal Rack PDU with UK LC
39Y8958	DPI Universal Rack PDU with AS/NZ LC
39Y8959	DPI Universal Rack PDU with China LC
39Y8962	DPI Universal Rack PDU (Argentina)
39Y8960	DPI Universal Rack PDU (Brazil)
39Y8961	DPI Universal Rack PDU (India)
0U Basic PDUs	
46M4125	IBM 0U 24 C13 30A 3 Phase PDU
46M4128	IBM 0U 24 C13 30A PDU
46M4140	IBM 0U 12 C19/12 C13 60A 3 Phase PDU

For more information, see the list of IBM Redbooks Product Guides in the Power infrastructure category: http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=power

Rack cabinets

The server supports the rack cabinets listed in Table 28.

Table 28. Rack cabinets

Part number	Description
93072PX	IBM 25U Static S2 Standard Rack
93072RX	IBM 25U Standard Rack
93074RX	IBM 42U Standard Rack
93074XX	IBM 42U Standard Rack Extension
93084EX	IBM 42U Enterprise Expansion Rack
93084PX	IBM 42U Enterprise Rack
93604EX	IBM 42U 1200 mm Deep Dynamic Expansion Rack
93604PX	IBM 42U 1200 mm Deep Dynamic Rack
93614EX	IBM 42U 1200 mm Deep Static Expansion Rack
93614PX	IBM 42U 1200 mm Deep Static Rack
93624EX	IBM 47U 1200 mm Deep Static Expansion Rack
93624PX	IBM 47U 1200 mm Deep Static Rack
99564RX	IBM S2 42U Dynamic Standard Rack
99564XX	IBM S2 42U Dynamic Standard Expansion Rack

For more information, see the list of IBM Redbooks Product Guides in the Rack cabinets and options category:
http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=rack

Rack options

The server supports the rack console switches and monitor kits listed in Table 29.

Table 29. Rack options

Part number	Feature code	Description
Monitor kits and keyboard trays		
17238BX	1723HC1 fc A3EK	IBM 1U 18.5" Standard Console
17238EX	1723HC1 fc A3EL	IBM 1U 18.5" Enhanced Media Console
172317X	1723HC1 fc 0051	1U 17in Flat Panel Console Kit
172319X	1723HC1 fc 0052	1U 19in Flat Panel Console Kit
Console switches		
3858D3X	3858HC1 fc A4X1	Avocent Universal Management Gateway 6000 for IBM
1754D2X	1754HC2 fc 6695	IBM Global 4x2x32 Console Manager (GCM32)
1754D1X	1754HC1 fc 6694	IBM Global 2x2x16 Console Manager (GCM16)
1754A2X	1754HC4 fc 0726	IBM Local 2x16 Console Manager (LCM16)
1754A1X	1754HC3 fc 0725	IBM Local 1x8 Console Manager (LCM8)
Console cables		
00AK142	A4X4	UM KVM Module VGA+SD Dual RJ45
43V6147	3757	IBM Single Cable USB Conversion Option (UCO)
39M2895	3756	IBM USB Conversion Option (4 Pack UCO)
46M5383	5341	IBM Virtual Media Conversion Option Gen2 (VCO2)
46M5382	5340	IBM Serial Conversion Option (SCO)

For more information, see the list of IBM Redbooks Product Guides in the Rack cabinets and options category:
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